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DOCKET NO. 81602

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Zbigniew S. Piec et al.

Application Serial No.: 10/684,090

Filed: October 10, 2003

For: HOMOPOLAR MACHINE WITH IMPROVED BRUSH LIFETIME

Group Art Unit: 2834

Examiner(s): Dang D. Le

DECLARATION OF ZBIGNIEW S. PIEC

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Zbigniew S. Piec, declare as follows:

1. That I hold a Ph.D. degree of engineering from Technical University of Szczecin granted in 2000 and that I am currently employed by General Atomics, the assignee of the above-identified application.
2. I have supervised engineering tests to determine the extent that wear is encountered by electrical brushes in their contact with a rotating armature surface in order to compare the wear when the brushes are charged negatively and against the wear when the brushes are charged positively with all other circumstances being held exactly the same.
3. Test equipment was arranged so that positively charged and negatively charged brushes of the same copper fiber material were caused to bear against the smooth surface of a rotating copper wheel. The arrangement was carefully monitored so that the brushes were

caused to bear against the surface of the wheel with precisely the same force. During the last two years, multiple experiments have been run at room temperature in an atmosphere of humidified carbon dioxide so as to remove oxidation from consideration. The copper wheels were rotated at between 400 and 500 rpm on a continuous basis for 2 to 3 weeks at a time.

4. Results from a portion of one such test is depicted in the attached graph (Exhibit A) entitled "Positive versus Negative Polarity Brush Wear". The amount of wear is shown on an exponential scale which is dimensionless; therefore, focus is properly upon the relative locations of the solid blue and green lines. The wear of the negatively charged brushes is shown by the solid blue line, and wear for the positively charged brushes shown by the green solid line. The test depicted is representative as one showing about 14 times greater wear for the positively charged brushes; the average difference in wear, determined over 2 years of testing, was slightly greater than one order of magnitude, i.e., the wear was slightly more than 10 times greater when the brushes are charged positively than when the brushes are charged negatively.

5. Because it had been the general understanding throughout this art of homopolar motors that it was simply a matter of choice as to whether brushes should be negatively charged or positively charged, these findings showing one order of magnitude difference in wear were truly surprising to me and my co-inventors, based upon this long time misunderstanding in this art that there should be little, if any, difference in wear based upon polarity alone.

Zbigniew S. Piec

Dated: May ___, 2004

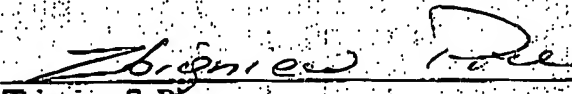
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signature page
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Zbigniew S. Plec

Dated: May 21, 2004

Positive vs Negative Polarity Brush Wear

